TUBERCULOSIS

Tuberculosis is the most common infectious disease in the world. A falling incidence has been reversed with increasing incidence in both developed and developing countries since the mid 1980s. This new epidemic is mainly due to AIDS and increased multi-drug resistant strains.

Problem Statement

In the world every year 1.04 crore cases are occurring (incidence of disease in the world is 1.04 crores). Deaths due to TB every year is 35 lakhs.

In India

Estimated prevalence of sputum positive patients is 0.4% (40 lakhs cases) or 4/1000 population. Estimated deaths due to TB every year is 5 lakhs.

A person infected with M.tuberculosis has 10% lifetime risk of getting tuberculosis and a person infected with M.tuberculosis and HIV has 50% lifetime risk of getting tuberculosis.

Scanned with ACE Scanner

Epidemiological Indices

1. Prevalence of disease (Sputum +ve cases) = 4/1000 population or 40 lakh cases.
2. Prevalence of disease (Sputum +ve and X-ray +ve cases) 12/1000 population or 1.2 crores cases.
3. Prevalence of infection
   a) In children under 5 yr of age is 2% to 4%.
   b) In population above 35 yr of age is 50%. Overall prevalence of infection is 30%.
4. Incidence of disease is 1.5/1000 population or 15 lakhs cases per year. (It was 1/1000. Now, because of AIDS, it increased to 1.5/1000.)

Every 3rd person in India was infected with M.tuberculosis.

Scanned with ACE Scanner

Epidemiology of Tuberculosis

1. **Agent factors**

a) **Agent**: The mycobacteria responsible for this disease are:

i) *Mycobacterium tuberculosis* (cause of the most of infections)

ii) *M. bovis* (endemic in cattle and spread to human by milk)

iii) Atypical mycobacteria or opportunistic mycobacteria, e.g., MAIS complex (*M. avium*, *M. intracellulare*, *M. scrofulaecium* and *M. kansasii*.

Tuberculous bacilli is acid fast bacilli. They are divided into rapid growers and slow multipliers. They may be extracellular or intracellular.

b) **Source of infection**: Common source of infection is the human case, whose sputum is positive and who have not been treated.

Scanned with ACE Scanner

Another source is milk *(M. bovis)*. In India it is not important at all.

Organisms cannot transmit from extrapulmonary lesions

c) **Portal of entry and portal of exit**: Through respiratory tract. It is airborne infection. Spread through droplets and droplet nuclei.

d) **Infectivity**: Patients are infected as long as they remain untreated.

2. **Host factors**

a) **Age and Sex**: TB affects all age groups. In India prevalence of infection under five years group is increasing; previously it was 1% and now it has gone up to 2%.

Prevalence of infection increases to 30% by the age of 15 yr and becomes 50% by the age of 40 years.

TB is more in males than in females.

b) **Heredity**: TB is not a hereditary disease. But inherited susceptibility to TB (an important risk factor) is present in some populations.

c) **Nutrition**: Undernourished children have more chances of getting tuberculosis. But there is no role of good nutrition in the treatment and recovery of the patient.

d) **Immunity**: There exists no inherited immunity. It is always cell-mediated immunity.

3. **Environmental and social factors**

TB is called a *social disease*. The disease is mainly related to poor sanitation, poor housing, overcrowding etc.

Kuccha, ill-ventilated, ill-lighted house is most favourable factor for transmission of tuberculosis.

Social factors like illiteracy, ignorance, poor utilisation of health care facilities, large families, malnutrition, poverty are other important social factors in causation of disease. Customs like using purdah is important social factor in causation of TB in some females.

Scanned with ACE Scanner

Incubation Period (or latent period)

Usually 4–6 weeks.

In case of reactivation of old lesions the latent period is in years (i.e., 5–60 years).

Route of Transmission

Transmission is through contact with *sputum-positive pulmonary cases.*

Direct contact: Through droplets. For this the distance between the case and susceptible person should not be more than six feet. Here the release of droplets will take place while coughing, spitting, talking etc.

Indirect transmission: Through droplet nuclei and infected dust (infected dust is created by indiscriminate spitting of an open case).

Disease Process in the Man

Following the inhalation of *Mycobacterium tuberculosis*, it enters the lung. A small subpleural lesion known as *Gohn lesion* develops there. It is usually at the apex of the lung (at the apex of lungs blood supply is less and concentration of oxygen is more, which is most favourable for the growth of TB bacilli). Then the infection spreads to hilar and mediastinal lymph nodes and produces *primary complex*. In 95% of the cases the primary complex heals spontaneously in 1–2 months with or without calcification. Now the individual becomes tuberculin positive. In a minority (1–5%) the infection spreads from primary complex locally to bronchus and to pleura and causes disease (usually 90% of TB cases are pulmonary TB and 1% is TB meningitis, 9% is extrapulmonary TB).

Diagnosis

Diagnosis of TB depends upon clinical symptoms and laboratory investigations.

Clinical Features

Usually the onset of disease is insidious with:

1. Prolonged, low-grade fever (fever for more than three weeks)
2. Chronic cough with expectoration (cough more than three weeks)
3. Haemoptysis
4. Chest pain.

Scanned with ACE Scanner

These four features are called cardinal features. If any one of this is present, he must need sputum examination. Three sputum samples are needed to take, preferably in two days period.

Other important clinical features are:

1. Evening rise of temperature
2. Night sweats
3. Recent loss of weight.

Microscopic examination of the sputum is the only way by which the diagnosis of pulmonary tuberculosis can be confirmed.

Investigations

1. Chest X-ray showing a cavity usually apical (suggestive of TB)
2. Raised ESR (very little value).
3. Examination of sputum microscopy (confirmation and practicable)
4. Culture (Lowen-stein–Jensen media): confirmation test but not practicable in all situations.

The diagnosis of TB by X-ray is unreliable becaus other chest diseases can resemble TB on an X-ray. Pulmonary TB may show various types of radiographic abnormalities. It must be stressed that the determination of clinical activity of TB by X-ray is totally unreliable.

The diagnosis of TB by X-ray is totally unreliable

But X-ray examination is useful only in smear -ve cases and symptoms suggestive of tuberculosis and patient had taken a course of antibiotics (other than tuberculous drugs) for one to two weeks without relief.

Scanned with ACE Scanner

method.

Complications of tuberculosis are:

1. Haemoptysis
2. Spontaneous pneumothorax
3. Pleural effusion
4. Empyema
5. Bronchiectasis
6. Fibrosis of lung
7. Cor pulmonale
8. TB meningitis.

Prevention and Control of Tuberculosis

Primary Prevention

1. Health promotion
2. Specific protection

Secondary Prevention

3. Early diagnosis and treatment

Tertiary Prevention

1. Disability limitation
2. Rehabilitation

Scanned with ACE Scanner

DOTS (Directly observed treatment, short course)

DOTS has five components. These are:

1. Political commitment
2. Case detection by sputum examination among symptomatic patients presenting at health services
3. Usage of standardised regimens of directly observed short course chemotherapy (DOTS)
4. Uninterrupted supply of free drugs
5. Monitoring and supervision.

The basic principle of DOTS is *prevention of transmission by diagnosing and curing people with infectious TB*. The problem with incomplete treatment is, it does not cure patients. Although these patients may not die, they do not get better either, and continue to spread TB in the community. Another problem of incomplete treatment is *drug resistance*.

In 1995–96, in the areas where DOTS is implemented, cure rate is 80% as compared to 40% in non-DOTS areas. DOTS also prevented relapses and reduced the chance of drug resistance. Out of 22 countries, 21 have adopted DOTS.

Scanned with ACE Scanner

India has several programs to combat tuberculosis (TB), including the Revised National Tuberculosis Control Programme (RNTCP), the National TB Elimination Programme (NTEP), and the Pradhan Mantri TB Mukt Bharat Abhiyaan (PMTBMBA).

Revised National Tuberculosis Control Programme (RNTCP)

- The largest TB control program in the world
- Provides free diagnosis and treatment for all TB patients
- Uses the Directly Observed Treatment Short-course (DOTS) strategy
- Has microscopy centers in general areas and in tribal, hilly, and difficult areas

Scanned with ACE Scanner

National TB Elimination Programme (NTEP)

- Offers free diagnosis and treatment for all types of TB
- Provides free chest X-rays for eligible presumptive TB cases
- Provides free pre-treatment evaluation and travel support for MDR patients
- Provides monthly routine diagnostic services for MDR TB patients

Pradhan Mantri TB Mukt Bharat Abhiyaan (PMTBMBA)

- Launched in 2022 to encourage community involvement in TB elimination
- Includes the Ni-kshay Mitra initiative, which provides diagnostic, nutritional, and vocational support to TB patients

Other initiatives include:

- Ni-kshay Poshan Yojana, which provides direct benefit transfers to TB patients
- Ni-kshay SAATHI model, which incentivizes treatment supporters

Scanned with ACE Scanner